



# Irrigation Water Management

## Conservation Practice Job Sheet - Expanded

### Natural Resources Conservation Service, Idaho

449 ID-JS 1 EX

October 2007

Client \_\_\_\_\_

Date \_\_\_\_\_



### Definition

Irrigation water management (IWM) is the process of determining and controlling the volume, frequency, and application rate of irrigation water in a planned, efficient manner.

### Purpose

IWM is applied as part of a conservation management system to support one or more of the following:

- Manage soil moisture to promote desired crop response
- Optimize use of available water supplies
- Minimize irrigation induced soil erosion
- Decrease non-point source pollution of surface and groundwater resources
- Manage salts in the crop root zone
- Manage air, soil, or plant micro-climate.

### Where used

This practice is applicable to all irrigated lands. An irrigation system adapted for site conditions (soil, slope, crop grown, climate, water quantity and quality, etc.) must be available and capable of applying irrigation water to meet the intended purpose(s).

### Conservation Management Systems

IWM is generally one of several components of a resource management system used to manage water supplied to a crop through an irrigation system that is

part of an overall resource management plan for the irrigated cropland.

### Irrigation Water Management Planning

IWM components of the conservation plan will contain the following information:

- field map(s) and soil survey information
- crop rotation or sequence
- recommended irrigation water application rates, timing, and method of application
- locations of designated sensitive areas
- guidelines for irrigation system operation and maintenance

IWM is most effective when used in conjunction with other conservation practices such as irrigation system design, cover crop, residue management, conservation buffers, nutrient management, pest management, and conservation crop rotation.

IWM requires knowledge, skills, and desire to determine when irrigation water should be applied. The main factors influencing IWM are **irrigation interval** (time between irrigations), **irrigation set time** (time water is applied), and **application rate** (rate at which water is applied). These parameters define the timing and duration of irrigation and the amount of water applied. System design and maintenance are also important factors influencing IWM.

## Water Rights

Under Idaho law all water is publicly owned and anyone planning to store or divert surface or groundwater for the purpose of irrigation must obtain a permit or water right from the Idaho Department of Water Resources. These permits or water rights must be obtained prior to the use of the water. It is the responsibility of the landowner to file for the necessary permits or water rights.

## Operation and maintenance

There are no operation and maintenance (O&M) aspects applicable to this standard. Necessary O&M items are addressed in the physical component standards considered as companions to this standard.

## Water Flow Rates and Conversion Factors

$$Q * T = D * A$$

where:

Q = flow rate (acre-in/hr or cfs)

T = time (hr)

D = gross depth applied (in)

A = area (acres)

## Specifications

Site-specific requirements for IWM are listed on specification sheets. Specifications are prepared in accordance with the NRCS Field Office Technical Guide. See NRCS practice standard, Irrigation Water Management, Code 449. Use a *Soil Survey* and NRCS National Engineering Handbook, Part 652 – *Irrigation Guide* or locally accepted references for procedures to calculate values such as application rates for various irrigation systems, and to estimate water holding capacities of soils.

$$Q = \frac{453 * A * D}{F * H}$$

where:

Q = flow rate (gpm)

A = area (acres)

D = gross application depth (in)

F = irrigation period (days)

H = hours of operation per day

### Water Flow Rates:

1 cubic foot per second (cfs)

= 448.8 gallons per minute

1 cfs for 1 hour = 0.99 acre-inch

1 cfs for 24 hr = 1.98 acre-ft

1,000 gpm = 2.23 cfs

1,000 gpm for 24 hr = 4.42 ac-ft

1 cfs = 40 miner's inches in

OR, AZ, MT, No. CA

1 cfs = 50 miner's inches in

ID, KS, NE, NM, ND, SD, So. CA

1 cfs = 38.4 miner's inches in CO

1 miner's inch = 9.0 gpm in ID

1 cfs = 28.32 liters/sec

1 cfs = 0.02832 cubic meters/s

1 cubic meter/sec = 35.3 cfs

1 liter/sec = 15.85 gpm

### Pump Power Requirement:

Horsepower =

$\frac{\text{Pump Head in ft} * \text{gpm}}{3960 * \text{Pump Efficiency}}$

### Water Volumes & Weights:

1 cubic foot = 7.48 gallons

= 62.4 lb

= 28.3 liters

1 acre-foot = 43,560 cubic feet

(1 acre covered 1 ft deep)

12 acre-inches = 1 acre-ft

1 million gallons = 3.07 acre-ft

1 acre-ft = 1,234 cubic meters

1 cubic meter = 1,000 liters

### Pressure and Pressure Head:

1 psi = 2.31 ft of pressure head

1 atmosphere (sea level)

= 14.7 psi = 33.9 ft of head

### Lengths and Areas:

1 mile = 5,280 ft = 1.61 km

1 meter = 3.28 ft = 39.37 inches

1 acre = 43,560 square ft

1 hectare = 2.47 acres

**IRRIGATION WATER MANAGEMENT SPECIFICATION SHEET**

Client: \_\_\_\_\_

Job Location: \_\_\_\_\_

County: \_\_\_\_\_ SWCD: \_\_\_\_\_ Farm/Tract No.: \_\_\_\_\_

Referral No.: \_\_\_\_\_ Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

**DESIGN APPROVAL:**

Practice Code NO.	PRACTICE	LEAD DISCIPLINE	CONTROLLING FACTOR	UNITS	JOB CLASS				
					I	II	III	IV	V
449	Irrigation Water Management	CED-WME & BCSD- Agron	Area	Acres	40	320	640	3200	All

This practice is classified as Job Class \_\_\_\_\_

Design Approved by: /s/ \_\_\_\_\_ Date: \_\_\_\_\_

Job title: \_\_\_\_\_

**CLIENT ACKNOWLEDGEMENT STATEMENT:**

The Client acknowledges that:

- The Client has received a copy of the specification and understands the contents and requirements.
- The Client will provide to NRCS the following information before this practice can be certified as applied:
  - ☐ Irrigation water application records which include the dates and amounts of water applied.
  - ☐ Documentation showing the irrigation scheduling technique used.
  - ☐ Evaluation of the irrigation system used.
- It shall be the responsibility of the Client to obtain all necessary permits and/or rights, and to comply with all ordinances and laws pertaining to the application of this practice.

Accepted by: /s/ \_\_\_\_\_ Date: \_\_\_\_\_

**CERTIFICATION:**

I have completed a review of the information provided by the Client and certify this practice has been applied.

Certification by: /s/ \_\_\_\_\_ Date: \_\_\_\_\_

Job title: \_\_\_\_\_

**IRRIGATION WATER MANAGEMENT WORKSHEET**

Client: \_\_\_\_\_ Date: \_\_\_\_\_

**IRRIGATION SYSTEM WALK-THROUGH INSPECTION EVALUATION**

This form is used to identify and evaluate those components of an irrigation system that directly affect irrigation system operation and water management. Other aspects not directly affecting irrigation water management, such as energy-use efficiency, may also be noted.

ITEM	OK	Needs attention	Comments
<b>Irrigation water supply</b>			
Adequate water supply for area irrigated	_____	_____	_____
Suitable quality of irrigation water supply	_____	_____	_____
Inflow controlled by valve and/or gate	_____	_____	_____
Inflow is measured easily and accurately	_____	_____	_____
Type of water measuring device: _____			
Source of irrigation water: _____			
Type of delivery schedule if applicable: _____			
<b>Irrigation water conveyance</b>			
Adequate capacity in ditch and/or pipe	_____	_____	_____
Ditch or pipe free of leaks	_____	_____	_____
Adequate water control devices	_____	_____	_____
<b>Irrigation water application</b>			
Adequate water control for uniform application	_____	_____	_____
Uniformity of application throughout field	_____	_____	_____
Wet and/or dry spots	_____	_____	_____
Excessive runoff Note: There should be no runoff from sprinkler-irrigated areas.	_____	_____	_____
<b>Overall system condition</b>			
General maintenance			
Other (note):			

**IRRIGATION WATER MANAGEMENT WORKSHEET**

Client: \_\_\_\_\_

NOTE: • This worksheet pertains to **each** crop irrigated and months throughout the growing season.  
 • A computerized version of this worksheet is available at NRCS field offices.  
 Make additional copies of this sheet as needed.

IRRIGATION REQUIREMENT HOW MUCH water to apply?	Date	Date	Date	Date	Date	Date
Field ID:						
Soil Name:						
Available Water Capacity (in/in): (Average throughout the managed root zone)						
Soil Intake Rate (in/hr) :						
Crop:						
Effective Rooting Depth (in) :						
Total Available Water Capacity (in): Effective rooting depth * Available Water Capacity						
Management-Allowed Deficit (%):						
Net Irrigation Requirement (in): Total Available Water Capacity * MAD						
IRRIGATION TIMING WHEN to apply water?						
Average Daily Crop Water Use (in/day):						
Irrigation Frequency (days): Net Irrigation Requirement / Daily Water Use						
Actual Irrigation Period (days) :						
Desired Net Irrigation Application (in): Daily crop water use * Actual Irrigation Period						
SYSTEM CAPACITY						
System Application Efficiency (%): (Water Required / Water Applied)						
GROSS Irrigation Requirement (in): (Net Irrigation Application / Application Efficiency)						
Irrigated Acres:						
Gross Application Requirement (acre-in): Gross Irrigation Requirement * Acres						
Required System Flow Rate (gpm or cfs) (Equations on p. 2)						
Compare Irrigation Timing and System Capacity with documented system operation - pp. 6-8						

# IRRIGATION WATER MANAGEMENT WORKSHEET

**Client:** \_\_\_\_\_

**NOTE: Make additional copies of this sheet as needed.**

[illegible]

# IRRIGATION WATER MANAGEMENT WORKSHEET

**Client:** \_\_\_\_\_ **Field ID:** \_\_\_\_\_

NOTE: Make additional copies of this sheet as needed.

[illegible]

# IRRIGATION WATER MANAGEMENT WORKSHEET

**Client:** \_\_\_\_\_ **Field ID:** \_\_\_\_\_

NOTE: Make additional copies of this sheet as needed.

[illegible]